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(GRASS AND FORAGE PLANT INVESTIGATIONS) RECEIVED

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### THE CULTIVATED VETCHES.

The demand for early spring forage plants is increasing in almost every section of the United States. This demand arises from a variety of causes, chief among which is the rapid increase of the dairying industry. Soiling crops and pastures supply the desired succulent forage from early summer until the first hard autumn



FIG. 1.—Hairy vetch: Plot in Grass Garden, U. S. Department of Agriculture.

freeze, and ensilage and root crops tide over the early winter. With good management such substitutes for green forage may be made to last until the grass starts, but on too many American farms there is a period of shortage of succulent feed in late winter and spring. To bridge over this critical period, annual leguminous crops, such as crimson clover and the vetches, are each year coming deservedly into greater prominence. The vetches are nitrogen gatherers. Like the clovers they have the property of absorbing through their roots the free gaseous nitrogen of the air, which is present in all well-cultivated

soils, and fixing a portion of it in a form which may become either a fertilizer if left in the soil or a muscle-making element in the forage. Nearly all leguminous forage crops have this property and hence their great importance as green manure and soiling crops.

The vetches are also useful because they form a living mulch in spring and early winter, shading the ground and preventing the growth of weeds, thus retarding the constant loss of soluble plant foods that is going on wherever a soil is left bare and unprotected



FIG. 2.—Hairy vetch or sand vetch (*Vicia villosa*): a, cross-section of stem; b, flower; c, stamens; d, pod.

from the direct action of the elements. A mulch of weeds would serve the same purpose, but all can see why it would be better to have the winter cover consist of vetches or clovers rather than of a tangle of noxious weeds.

In the Southern States vetches should be sown in the late summer or early fall, so that they may be out of the way in time to plant the next season's field crops. In the North or wherever the winters are

severe they may be sown in early spring at the same time as the spring wheat or other small grain. They are all crops which delight in cool growing weather like that of the northern spring or fall and the southern winter.

#### HAIRY VETCH, OR SAND VETCH.

(*Vicia villosa*.)

This annual leguminous plant (fig. 2) is a native of western Asia. It has been cultivated for about fifty years in some parts of Europe, especially southern Russia, Germany, and France, and was introduced into this country for the first time about 1847, under the name of Siberian vetch. Its cultivation was then neglected until its reintroduction about twelve years ago by this Department. It has since been tried in various parts of the United States. Excellent reports as to its drought-resisting qualities and its adaptability to our climate have been received from Washington, Nebraska, Georgia, New Mexico, South Dakota, Minnesota, Montana, and Pennsylvania. It has been grown on the experimental grounds of the Department of Agriculture at Washington, D. C., and has proved to be thoroughly adapted to and valuable for this locality. The seed was sown about the 25th of April, and the plants commenced to bloom the middle of July, continuing in flower until the end of November. Sown in August it grew well until the first hard frost and continued an intermittent growth all winter during periods of open weather. By the middle of March it had formed a thick mat of vines over the soil. It blossomed by the first of May and was then ready to be cut. Hairy vetch withstands winter cold and summer drought, but it does not do well where there is an excess of water in the soil. It is one of the most promising fodder crops which has been brought into the United States in recent years and by some is considered especially valuable for light sandy soils.

#### CULTIVATION.

Hairy vetch may be sown in autumn, from about the middle of August to the middle of September; or in spring, from the latter part of April to the middle of May. It should be sown broadcast or with a grain drill at the rate of 1 to 1½ bushels of seed per acre. The latter method will require a less amount of seed. When the seed is put in broadcast, a bushel of rye, oats or wheat should be sown at the same time, so as to furnish a support to keep the vines up off the ground. If it is sown in drills in the latter part of August the crop should be cultivated several times. It will furnish some forage in autumn, and where the winter is not too severe will start to grow again in the spring, thus producing forage in late autumn and early spring, at the two periods when it is most needed.

While it gives a fair crop on poor soil it is most profitable as a forage plant on rich and well-tilled land. It needs considerable moisture during the first six weeks of its growth, but when once fairly established withstands drought and extremes of temperature. The seeds germinate poorly when they are more than two years old. Most of the seed used in this country is imported from Europe, so that particular care ought to be taken by importers and dealers to handle none but such as can be sold under guarantee as good, fresh seed.

At the Mississippi Agricultural Experiment Station seed of this vetch was sown in October, 1888, and since that time has given heavy annual crops on the same ground, although receiving no attention. Its seeds germinated with the first autumn rains, and covered the ground by the first of January, furnishing good grazing until April or May. If the stock is taken off the field in March the plants will mature and reseed the ground freely for the next year.

#### FORAGE VALUE.

Hairy vetch is eaten with relish by all kinds of stock. If properly cured it makes good hay, though on account of its habit of growth the process is difficult. It has been tested in the silo in alternate layers with green corn and also alone. The former method is the one to be used if the best ensilage is desired. It is a most excellent forage plant for soiling purposes. On account of the difficulty of curing it properly, it will give the most satisfactory results fed in this way.

The seed is as yet very expensive, being about \$4 per bushel of 70 pounds. As soon as its cultivation has increased to such an extent that the seed may be obtained at prices less prohibitive, this vetch will undoubtedly occupy a permanent place in American agriculture.

#### SPRING VETCH, OR TARES.

(*Vicia sativa*.)



FIG. 3.—Spring vetch or tares (*Vicia sativa*):  
a, pod.

Spring vetch is a leafy, annual, trailing herb, 1 to 2 feet high, with 4- to 5-angled stems, simple or branched from the base. The leaves are compound and terminate in 3 or 4 tendrils. The 5 to 7 pairs of leaflets are broadest above the middle, blunt or notched at the end, and tipped with an abrupt point (fig. 3). The flowers are rather large, deep purple, one or two together in the axil of the leaf on a very short stalk. The plant is soft and hairy all over.

#### HISTORY.

This old-world forage plant has been cultivated in Europe for nearly twenty centuries. It is a native of western Asia and of all Europe except Lapland. It was cultivated by the Romans, and was esteemed by them a valuable fodder crop. In Italy it has been grown continuously up to the present day. It is one of the many soiling crops in use in northern Europe and the British Isles. Spring vetches were introduced into the United States in a casual way nearly a hundred years ago. They have been tried in nearly all the States and have proved very unsatisfactory, except for certain districts in

New England, New York, northern Michigan, Wisconsin, and lower Canada. They were very largely grown throughout the New England and Northern States during the period from 1865 to 1885, but their cultivation there has now almost ceased, it having been found that the yield of hay or of green fodder is not a profitable one compared with that of the red and crimson clovers and field peas. The principal drawback to their more extensive cultivation is the high price of the seed (\$2.50 to \$3 per bushel of 70 pounds) and the fact that they can not withstand even temporary drought or hot weather. In England, where they are extensively used, the growing season is much cooler, with more rain and an equable temperature.

#### CULTIVATION.

Spring vetches seem to be adapted more particularly to northern countries, where the season is short and the rainfall abundant. The seed should be sown at the rate of 5 to 8 pecks per acre, with one bushel of rye or oats as a nurse crop. As high a seeding as 3 to 3½ bushels per acre is sometimes recommended, but the product per acre will not warrant the use of so much seed at the present high prices. Vetches should be sown in April or May. They will be ready to cut by the middle of June or the first of July, from full bloom until the pods are half formed. When sown alone the vines lodge and make a dense mat, and the object of the nurse crop is to furnish a support to lift the vines up off the ground. The vines are very difficult to harvest when sown alone, on account of the tangled mass of stems, but may be easily cut with a pea harvester. An acre of vetch and oats yields ordinarily from 6 to 8 tons of green forage. Where it can be grown, its chief value arises from the fact that it is ready to cut between the first and second crops of red clover, thus filling a gap in the series of early summer soiling crops. Spring vetches are also used for hay. To make hay, more care is required than with red clover. Two crops are sometimes cut in one season, and where this is possible the second is the one to be saved for seed. The first crop ripens very irregularly, and some of the pods will be shelled before the rest are ripe. Where they can be grown they are a very good summer feed for horses, but must not be fed earlier than full bloom, on account of their diuretic action. They are good for soiling sheep and milch cows, and are said to very materially increase the flow of milk.

#### FEEDING VALUE.

The percentage of digestibility of spring vetch forage has not been determined in this country, but analyses show a high food content comparable with alfalfa rather than the clovers. The average sample of vetch hay contains 11.3 per cent water, 7.9 per cent ash, 17 per cent crude protein, 25.4 per cent fiber, 36.1 per cent nitrogen-free extract, and 2.3 per cent fat. The flat pea and the soy bean are the only leguminous fodders which exceed this in the crude protein content.

#### FERTILIZING VALUE.

At the time when ready to cut for hay the vetch contains about 20 per cent of dry matter,<sup>1</sup> and in this 20 per cent there are contained

<sup>1</sup> Third Ann. Rept. Conn. (Storrs) Agr. Expt. Sta. (1890).

3.16 per cent nitrogen, 0.72 per cent phosphoric acid, and 3.36 per cent potash. Calculating on this basis the fertilizing ingredients contained in a crop of twelve tons of green forage produced from one acre there would be 153 pounds of nitrogen, 37 pounds of phosphoric acid, and 163 pounds of potash. In addition to this the stubble and roots to the depth of 22 inches would contain 27.2 pounds of nitrogen, 7.2 pounds of phosphoric acid, and 21.8 pounds of potash, making a total of 180.2 pounds of nitrogen produced in a single season by one crop of spring vetches, or as much as is contained in 18 tons of barnyard manure.

Spring vetches are not recommended as a forage crop for general cultivation. They have value for some few northern localities, but have proved a signal failure elsewhere in this country. The plants come into flower very unevenly, so that sometimes the seed does not ripen in sufficient quantities at one time to pay for harvesting. The crop is liable to injury by drought and excessive heat.

#### WINTER VETCH.

(*Lathyrus hirsutus*.)



Winter vetches (fig. 4) were introduced into the United States from Italy, where they are grown quite extensively as a winter soiling crop. They are of value only in the Southern States and have not been found hardy anywhere north of the latitude of Washington, D. C.

Winter vetches are very similar in habit and manner of growth to the spring vetches or tares. They are trailing, vine-like plants that grow in dense masses. The stems are narrowly wing-margined; the narrow leaflets are in pairs with a tendril arising between them; the inch-long pods are quite hairy; and the rounded, dark-brownish seeds appear warty under a lens.

#### WINTER VETCHES FOR THE SOUTH.

FIG. 4.—Winter vetch (*Lathyrus hirsutus*).

Winter vetches should be sown broadcast in August or September at the rate of two bushels of vetch and one bushel of winter rye or winter oats per acre. If sown in the latter part of August they furnish a bit of green forage in November and December, at a time when it is particularly desirable, and can be cut for hay in the early spring. Winter vetches sown in February in the Gulf States provide a supply of green forage in April or May. The plant deserves to be more widely cultivated as it is valuable both as a soiling and a hay crop. It makes its best growth in the spring and autumn, when the weather is cool. Winter vetches thrive on any soil which will grow cowpeas, provided that it is not too wet. Its cultivation has been very successful in all portions of the South where it has been tried, and particularly so in central Georgia and Alabama. The winter vetch is desirable as an addition to our list of

forage plants, because it lengthens out the soiling season, and furnishes green foliage late in autumn and very early in spring, during two periods of scanty vegetation. Winter vetch should be cut for hay when in full bloom. Considerable care is required to get it into the stack or barn without its heating. Anyone who can make good cowpea or alfalfa hay can successfully handle winter vetch.

#### KIDNEY VETCH.

(*Anthyllis vulneraria*.)

The kidney vetch (fig. 5) is a perennial leguminous plant which is found wild over a large part of Europe. It grows naturally along roadsides, wherever the soil is dry and thin and the subsoil calcareous. It was first introduced into cultivation by a German peasant about 40 years ago. This farmer noticed that the vetch grew on the dry calcareous soils of hillsides, in places too poor to support even white clover. He gathered a few seeds, sowed them the next year, and kept on saving and sowing the seed until he had enough to plant quite a large field. From this small beginning the cultivation of the kidney vetch has spread throughout northern Germany and many foreign countries, and to the United States.

#### CULTIVATION.

In Germany the custom is to sow the seed in autumn at the rate of 18 to 22 pounds per acre, with oats, barley, or other small grain as a nurse crop. Sometimes it is sown alone in the spring. The product of the first year is very small, so that it is only a profitable crop when it is sown with grain, in order that some income may be derived from the land during that time. The second year the vetch throws up large stems that often make a growth of 3 or 4 feet high.

The yield of hay is quite small, generally not more than one cutting per season, and perhaps a ton or a ton and a half of hay per cutting. It is cut in full bloom, and cured in about the same way as red clover. Two crops may be secured in one season by cutting the first before the plant blossoms, but usually the aftermath, consisting entirely of root leaves, is pastured and no attempt is made to get more than one crop of hay.



FIG. 5.—Kidney vetch (*Anthyllis vulneraria*): a, flower.

Kidney vetch is not recommended for sowing in the United States, except on poor, thin, calcareous or very sandy soils, which are too sterile to support the red or crimson clovers, or any of the better forage crops. It has been tried at a number of the experiment stations throughout the United States, but has been reported as of small value.

#### DAKOTA VETCH.

(*Lotus americanus*.)

One of the most valuable leguminous plants of the vetch family is Dakota vetch (*Lotus americanus*) (fig. 6). It is a bushy annual found throughout the Rocky Mountain region of the Northwest, being most abundant upon the sandy river bottoms. Stock of all kinds are fond of it and it is used either as pasturage or hay. In the upper Missouri region it is one of the most highly prized native forage plants. Being an annual it must be permitted to mature at least a portion of its seed and consequently should not be grazed too closely nor cut too early. The blooming season covers a considerable period, so that buds, flowers and both mature and green pods are often found upon a plant at the same time. As a rule many of the seeds are ripened before the haying season arrives and it is a common practice among ranchers to use hay racks with tight bottoms in order to save the shattered seed, which later is scattered or sown over the meadows. The plant reseeds itself freely and when once established voluntary crops are assured from year to year.



FIG. 6.—Dakota vetch (*Lotus americanus*).

#### BIRD VETCH.

(*Vicia cracca*.)

Bird vetch is a perennial species from Europe, where it is cultivated, and is used both for soiling and for hay. It is recommended for cultivation in low meadows and especially in open woodlands. In Germany it is often found in barren sheep pastures and is there deemed especially valuable on account of its nutritive value, the fodder being especially rich in protein.

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